REMARKS

The Specification

Informalities

The Examiner's specific comments as to informalities in the specification (Office Action at 3) have been addressed by amending the specification accordingly.

Antecedent Basis

The Examiner contends that the specification fails to provide proper antecedent basis for the claimed subject matter. The Examiner requires Applicant to correct the following: "The disclosure lacks detailed descriptions of the structural relationships between the three 'processing chambers' of claims 1-3, the plurality of collection surfaces of claims 6, and the valves (in particular the third, fourth, fifth, and sixth valves) of claims 7-9." Office Action at 2.

In response to the Examiner's request that Applicant provide structural details in the specification to provide antecedent basis for what is claimed, Applicant amends page 7, line 18 through page 8, line 2 with the following text (as specified above in the "Amendments" section of this Response) which is supported by the claims and therefore does not add new matter:

"Fig. 2 shows the present invention ~~of the~~ high pressure chemical vapor trapping system. The exhaust from the processing chamber 110 is pumped away by the vacuum pump 130. The pressure in the process chamber foreline 115 is normally low, in the range of torr or millitorr pressure. After the vacuum pump, the pressure is almost atmospheric at the vacuum pump exhaust 135. The hot trap 120 converts un-reacted precursors to the precursor by-products, and the cold trap 140 converts the gas phase by-products to non-gaseous phase by-products for ~~easily~~ easy transport and storage. The present invention connects to the downstream of the vacuum pump to take advantage of the high pressure at the pump exhaust. By not disturbing the chamber configuration, there is no potential contamination of the process."

Without adding new matter, Applicant further adds the paragraphs (as specified above in the "Amendments" section of this Response) below to follow the paragraph as amended above, to conform the specification to the amended figures, and to provide the detailed description of the structural relationships between the three "processing chambers" of claims 1-3, the plurality of

collection surfaces of claim 6, and the valves of claims 7-9:

"In particular, Fig. 2 shows a processing chamber 110 connected by a process chamber foreline 115 to a vacuum pump 130. The vacuum pump 130 can be a wet pump that uses oil, or a dry pump. As discussed above, both types of pumps operate at temperatures well-below any range of temperature that might result in damaging deposition in the pump. The vacuum pump 130 exhausts through exhaust line 135, which is connected with an input port 161 for a hot trap 120. The vacuum pump creates high pressure at the hot trap input port 161. The input port 161 of the hot trap 120 has a first valve 150 to prevent exhaust from escaping when the hot trap is disconnected for cleaning or other purposes. The hot trap 120 also has an output port 163 having a second valve 153 which is also used to prevent exhaust from escaping from the hot trap 120 when the hot trap is disconnected from the system 100 for cleaning or other purposes."

"The hot trap 120 may also contain a plurality of collection surfaces 159 extending into the hot trap 120. These collection surfaces 159 can be heated by a chamber heater 157 to the temperature of the hot trap 120, generally ranging from 100°C -500°C. The chamber heater 157 is depicted generically as a coil in the drawings, but the chamber heater 157 need not be an isolated element. Without limitation and by way of example only, the chamber heater alternatively can be associated with the collection surfaces159 or it can be part of the chamber itself. The collection surfaces 159 collect deposited solid metal waste, which can be reclaimed from the collection surfaces 159 when the hot trap 120 is disconnected to be cleaned."

"Moreover, in another aspect of the invention depicted in Fig. 3, the hot trap 120 can be biased with a negative voltage 127 to attract positively charged metal from, e.g., an MOCVD precursor to the collection surfaces 159. Alternatively, the hot trap 120 can be biased with a positive voltage to attract negatively charged metal from an MOCVD precursor to deposit on the collection surfaces 159. In yet another aspect of the invention, the hot trap 120 can be connected with a catalyst inlet 125 to accelerate the deposition process and thereby improve the efficiency of the hot trap 120. The other elements depicted in Fig. 3 are essentially the same as the elements in Fig. 2."

"In both Figs. 2 and 3, the output port 163 of the hot trap 120 is operatively connected with the input port 165 of a cold trap 140 located downstream of the hot trap 120. The cold trap accepts chemical vapors from the hot trap via the cold trap input port 165 and cools the vapor with a cooler 175 to a temperature lower than the temperature of the hot trap 120. The cooler 175 can be either part of the cold trap chamber itself, or it can be associated with waste collection surfaces 160. The temperature in the cold trap 140 in one embodiment can be 25°C to negative 200°C. As by-products exhausted from the hot trap 120 are cooled, they deposit as solid waste on waste collection surfaces 160 in the cold trap 140. Remaining vapor is exhausted through an output port 171 of the cold trap 140."

"Similar to the hot trap 120, the cold trap 140 can be disconnected from the system 100 for cleaning solid waste without allowing vapor to escape. Disconnection of the cold trap 140 is accomplished with the input port valve 169 and output port valve 173 of the cold trap 140. Once chemical vapors are exhausted from the output port 171 of the cold trap 140, they are exhausted out of the system 100."

"In an alternative embodiment 200 (Fig. 4), the vapor exhaust is forwarded through the output 271 of the cold trap 240 to a second cold trap 242, located downstream of the first cold trap 240, and which is maintained at a lower temperature than the first cold trap 240 with a cooler 277. The elements upstream of the second cold trap are essentially the same as those depicted in Figs. 2 and 3, with the exception as noted above, that the vapor exhaust is not exhausted out of the system, but rather, through the second cold trap. The second cold trap 242 accepts chemical vapor exhaust through an input port 279 of the second cold trap 242, which is connected with the output port of the first cold trap 240. The lower temperature of the second cold trap 242 relative to the first cold trap 240 results in further deposition of solid waste at collection plates 260 in the second cold trap 242. Remaining chemical vapor is exhausted through an output port 285 of the second cold trap 242 and out of the system 200. Similar to the first cold trap 240, the second cold trap 242 can be disconnected from the system 200, for cleaning or other purposes, without release of chemical vapors by closing input valve 281 and output valve 283."

The final paragraph of the specification is hereby deleted because it is duplicative of the description of Figs. 3 and 4.

A brief description of new Fig. 4 is added to page 7, after line 14, which is the last line of the brief description for Fig. 3; Figs. 2 and 3 have been replaced.

The Claims

Claim Objections

The Examiner objects to claims 3, 13, and 14 because of the following informalities: claim 3, second line, "e)" should be changed to "d)". Office Action at 3. Applicant respectfully submits that the letter designations in independent claim 1 have been removed, so that the objection is moot, and no change in designation from "e)" to "d)" is necessary.

The Examiner objects to claims 13 and 14 because the first line of each of these claims refers to a "low" pressure chemical vapor trapping system, but should instead refer to a "high" pressure chemical vapor trapping system. Office Action at 3. Applicant respectfully submits that the revision of "low" to "high" in claims 13 and 14 has been made.

The Examiner objects to claim 13, second line, which recites "furthers," but instead should recite "further." Applicant respectfully submits that the correction has been made to claim 13.

Having made the corrections based on the Examiner's objections, Applicant respectfully requests reconsideration of these claims and a determination that they are patentable.

Double Patenting

The Examiner has made a provisional double-patenting rejection of claims 1, 4, 5, and 10-14 based on Applicant's co-pending U.S. Application Ser. No. 09/589,633 (Attorney Docket No. TEGL-01192US0/SRM-MEL). Applicant respectfully submits that a terminal disclaimer will be filed to overcome the rejection in this case and in the co-pending case. Applicant has informed the Examiner in the co-pending case of the existence of the instant application, and of Applicant's intention to file a terminal disclaimer in the instant case.

Claim Rejections – 35 U.S.C. § 112 ¶ 2

The Examiner rejects claims 1-14 for failing particularly to point out and distinctly to claim the subject matter which Applicant regards as the invention. Office Action at 4-5. Regarding claims 1-3 and 6-9, the Examiner states that certain structural relationships were unclear from the drawings and specification, namely: (a) details of the three processing chambers of claims 1-3; (b) the plurality of collection surfaces of claim 6; and (c) the third, fourth, fifth, and sixth valves of claims 7-9.

Applicant responds that, as to (a), the "processing chambers" wording in all claims has been amended to refer to a hot trap, a first cold trap, and a second cold trap (where relevant). The term "processing chamber" is reserved for referring to the entity in which wafer processing occurs. The figures and specification have been amended (above) to include the structural relationships among the hot trap, processing chamber, and one or more cold traps, as set forth in the claims. Therefore, no new matter has been added in defining the structural relationships.

No further details regarding these structures is necessary. First, the different types of chambers are not the novel features of the present invention. Rather, the arrangement of the processing chamber relative to the vacuum pump, the hot trap, and the cold trap(s) is the novelty of the invention. Moreover, one of ordinary skill in the art at the time of invention would have known what was meant by the different types of traps, and by "processing chamber," as evidenced, by way of example only, the 1991 Varrin reference cited in the Examiner's Office Action.

Applicant further responds as to (b) that the specification already describes and the figures now depict the plurality of collection surfaces recited in claim 6. Regarding the "metal collection surfaces" in claim 6, the specification at page 6 notes that where an MOCVD precursor is used, the first chamber, *i.e.*, the hot trap, has a plurality of heated metal plates or collection surfaces made of the same metal as the MOCVD precursor. The collection surfaces collect the metal waste from the MOCVD precursor deposited in the hot trap as the precursor is heated. The metal then can be reclaimed from recycling after it accumulates on the collection surfaces. Figures 2 and 3 now depict the "metal collection surfaces," which are numbered 159 in the hot trap in figure 2; 160 in the cold trap in figure 2; 259 in the hot trap in figure 3; and, 260 in the first cold trap and second cold trap in figure 3.

Further details concerning the "plurality of collection surfaces" are unnecessary, as these

features are not the novelty of the present invention. Rather, the arrangement of the processing chamber relative to the vacuum pump, the hot trap, and the cold trap(s) is the novelty of the invention. Moreover, one of ordinary skill in the art at the time of the invention would have understood what is meant by "metal collection surfaces." See, e.g., U.S. Pat. No. 5,303,558 issued on April 19, 1994 to Caton et al., entitled, "Thermal Trap for Gaseous Materials," which discloses the invention of a hot trap, placed upstream of a vacuum pump (unlike the present invention), used in a CVD process, the hot trap having collection surfaces disposed within it. Abstract.

Regarding (c), Applicant responds that details have been added to the specification and to the figures, supplying the structural relationships of the third, fourth, fifth, and sixth valves, as set forth in the claims. No further details are needed for the reasons stated above. One of ordinary skill in the art at the time of the invention would have known of the use of valves to separate different chambers, hot traps, cold traps, vacuum pumps, etc., as established by the Varrin reference, among others, which the Examiner cited in the Office Action.

The Examiner further indicates that the claim 7 [sic: should be claim 6] limitation, "the metal collection surfaces" lacks sufficient antecedent basis and is unclear as to what metal is being collected on the collection surfaces. Claim 6 has been amended to provide proper antecedent basis. Specifically, "metal" collection surfaces has been modified to be consistent with the "plurality of" collection surfaces terminology.

Given the foregoing explanation and amendments to the claims, specification, and figures, claims 1-3 and 6-9 particularly point out and distinctly claim the subject matter of the invention. Applicant respectfully requests reconsideration by the Examiner of the rejection of claims 1-3 and 6-9 based on 35 U.S.C. section 112, second paragraph.

Claim Rejections – 35 U.S.C. § 103(a)

The Examiner rejects claims 1-9 as obvious over Varrin, Jr. et al., U.S. Pat. No. 5,015,503 ("Varrin") because the prior art structure is capable of performing the intended use. In particular, the Examiner contends that one of ordinary skill in the art would have recognized that the use of a plurality of valves, which can be selectively opened or closed, would determine which of the conduits would serve as input and.or outlet ports for each respective processing chamber, and the positions of the valves can be used to select heating and cooling of the chambers for selective

cleaning, disassembling, and/or replacement of individual chambers.

Applicant respectfully disagrees that the present claimed invention is obvious over Varrin. Varrin does not teach a linear system, as does the present invention. Applicant's claimed invention is a high pressure vapor trapping system that is driven by a vacuum pump connected downstream from the processing chamber and upstream from the hot trap, and the hot trap is connected upstream from the cold trap. The disclosed and claimed system is connected and operated linearly. In contrast, Varrin teaches a closed-loop re-circulating flow system that operates by thermosiphon flow. (Abstract.) The apparatus in Varrin is not apparently set up to connect the various elements linearly. Applicant respectfully submits that it would not be obvious to one of ordinary skill in the art to manipulate the numerous valves associated with the Varrin apparatus so that the Varrin apparatus is connected in the same way as the present claimed invention; that is, in a linear mode arranged, from upstream to downstream, with a vacuum pump, hot trap, at least one cold trap, and a waste exhaust. In fact, Varrin appears to teach away from the present Applicant's invention. In particular, Fig. 7 of Varrin, discussed at Col. 7, ll. 31-39, indicates that when the apparatus is operated in once-through mode, no vacuum pump is used, and most of the apparatus is kept cold, *i.e.*, without a hot trap. Applicant respectfully requests that should the Examiner disagree with Applicant's understanding of Varrin, that the Examiner indicate the part of the disclosure of Varrin upon which the Examiner relies for Applicant to address in any future Office Actions that may be based on Varrin.

The Examiner also rejects claims 10-14 under 35 U.S.C. section 103(a) as being unpatentable over Varrin in view of Kumada et al., U.S. Pat. No. 5,405,445 ("Kumada"). The Examiner contends that, although Varrin does not disclose the use of a bias voltage and a catalyst, Kumada discloses a vacuum extraction system for a CVD reactor vessel with a trapping device, in which the CVD apparatus includes a reactor vessel having first and second electrodes through which an RF bias is applied. Office Action at 7. The system includes a trapping device having a perforated tube member that supplies a gaseous oxidizing agent. Office Action at 7.

Applicant respectfully disagrees that claims 10-14 are obvious over Varrin in view of Kumada for the same reasons set forth above concerning Varrin.[1] Without Varrin, no prima facie case of obviousness exists. Kumada teaches away from the present invention because the Kumada system provides a reactor vessel upstream of a trapping means, with the trapping means upstream of

[1] Claim 14 has been cancelled, but its substance has been incorporated into claim 13.

the pump. *See, e.g.*, Col. 2, ll. 18-23; *see also* claim 1. The present invention places the vacuum pump upstream of the hot trap and cold trap(s).

Moreover, regarding the addition of a catalyst, claim 13 is not obvious in light of Kumada. The oxidizing agent in Kumada is added into the trapping device of that system, Col. 4, ll. 60-66, but it is added in a different manner, establishing that Kumada teaches away from the present invention. Kumada teaches discharging a heated gaseous oxidizing agent such as O_2 or H_2O, from a perforated tube member into another concentric pipe in the trapping device. Col. 4, l. 60-Col. 4, l. 39. As noted above, the vacuum pump of Kumada is *downstream* of the trapping means and thus, the oxidizing agent, which is preferably heated, is added *before* the vacuum is applied. In contrast, the present invention discloses and teaches a chemical vapor trapping system in which the vacuum is positioned *upstream* of the hot and cold trap(s), to maintain high pressure and increase efficiency of the hot trap, and the oxidizing agent is added *after* the vacuum; there is no mention of heating the oxidizing agent. Moreover, in the present invention, the oxidizing agent is added into the hot trap by a separate input port and not, as in Kumada, through a perforated tube inside a concentric tube carrying a gas exhaust. It would not have been obvious to one of ordinary skill in the art to add an oxidizing catalyst before the vacuum is applied, and to the hot trap directly, instead of into the exhaust stream.

Nor would it have been obvious over Varrin in view of Kumada to bias the hot trap collection surfaces with a voltage to attract charged metal to deposit on the collection surfaces from an MOCVD precursor. Varrin is not relevant for the reasons set forth above. Kumada teaches applying an RF voltage between the first and second electrodes *in the reactor vessel, i.e.*, where the CVD processing occurs, to create a plasma. Col. 3, ll. 23-49. In contrast, the present invention teaches adding a bias voltage *to the hot trap*, not the reactor vessel, for the purpose of accelerating the deposition of metal on the collection surfaces, and not, as in Kumada, for developing a plasma. Therefore, Applicant respectfully submits that the present invention would not have been obvious over Varrin in view of Kumada.

In light of the above, it is respectfully submitted that all of the claims now pending in the subject patent application should be allowable, and a Notice of Allowance is requested. The Examiner is respectfully requested to telephone the undersigned if he can assist in any way in expediting issuance of a patent.

The Commissioner is authorized to charge any underpayment or credit any overpayment to

Deposit Account No. 06-1325 for any matter in connection with this response, including any fee for extension of time, which may be required.

Respectfully submitted,

Date: 6/29/04

By: _____

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